California Technology Assistance Project

Summary of Statewide Results

From the

2002 California School Technology Survey

California Department of Education

and the

California Technology Assistance Project

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TABLE OF CONTENTS

Introduction

In early 2002, the California Department of Education in conjunction with the California Technology Assistance Project (CTAP) began the third annual statewide data collection activity designed to assess the education technology resources in K-12 public schools. Each district and school in California was asked to login to an online survey web site and report information on the amount and type of technology available, as well as information on how technology is used at the site, how teachers, administrators, and student utilize technology, and the level of technology support available to the school. So that valid regional and statewide results could be reported, a random stratified sample of elementary, middle, and high schools was selected. Throughout the spring of 2002, CTAP provided technical assistance to schools completing the survey and worked to ensure that a sufficient number of schools in the random sample submitted data. In all, data was collected from 2,901 schools in the random sample (93 percent of the random sample) and a total of 8,186 schools (91.1 percent of all schools).

This summary of results includes information on the Internet connectivity; available hardware, including the student-to-computer ratio, student-to-Internet-connected-computer ratio, and the student-to-multimedia-computer ratio (based on the assumption that all recent-generation multimedia computers are Internet-capable); technical support; curriculum support; technology planning and use; and faculty and student use of technology tools. A similar data collection effort was conducted in 2000 using a paper survey and in 2001 using an online survey. When possible, results from the 2002 survey have been compared with the 2000 and 2001 surveys. Dr. Donald Tetreault, under contract with the Los Angeles County Office of Education, completed the data analysis contained in this report and contributed to this summary on behalf of CTAP and the California Department of Education. His contribution to this effort is gratefully acknowledged. When considered in aggregate, these data present a complex, yet compelling, portrait of educational technologies in California's public schools.

In the last few years, as schools have acquired more computers, and high-speed connections to the Internet have become more common, new challenges and obstacles have arisen. While there is a critical need for trained technicians to repair and maintain computer equipment in schools, system and network administration staff are often lured away from public schools by higher paying jobs in the corporate sector; and although teachers are rapidly developing basic computer competencies, many are still learning about ways to integrate technology into the curriculum in order to impact student learning. We have come a long way, but we recognize that there remains a greater set of challenges before us.

Highlights from the CALIFORNIA STATEWIDE RESULTS

Connectivity & Access	**2000**	**2001**	**2002**
Schools connected to the Internet	**80%**	**90%**	**96%**
Classrooms connected to the Internet	**58%**	**77%**	**84%**
Student/Computer Ratio	**6.97**	**6.37**	**5.30**
Student/Internet-Connected Computer Ratio	**11.05**	**10.43**	**7.01**
Student/Multimedia Computer Ratio	**9.51**	**8.24**	**9.10**

Connectivity & Access by School Type	**Elem**	**Md/Jr Hi**	**High**
Schools connected to the Internet			
2000	**78%**	**85%**	**82%**
2001	**89%**	**93%**	**93%**
2002	**96%**	**98%**	**99%**
Classrooms connected to the Internet			
2000	**53%**	**60%**	**67%**
2001	**72%**	**76%**	**88%**
2002	**80%**	**83%**	**94%**
Student/Computer Ratio			
2000	**7.57**	**6.27**	**6.41**
2001	**6.96**	**6.29**	**5.51**
2002	**6.08**	**5.75**	**4.11**
Student/Multimedia Computer Ratio			
2000	**10.59**	**9.51**	**7.93**
2001	**9.49**	**8.14**	**6.61**
2002	**12.47**	**11.32**	**5.56**

Connectivity & Access by Measures of Poverty	**Free and Reduced-Price Lunch Eligible Enrollment**				
	0-20%	**21-40%**	**41-60%**	**61-80%**	**81-100%**
Schools connected to the Internet					
2000	**81%**	**85%**	**80%**	**76%**	**74%**
2001	**91%**	**92%**	**88%**	**91%**	**89%**
2002	**97%**	**97%**	**95%**	**96%**	**96%**
Classrooms connected to the Internet					
2000	**70%**	**64%**	**62%**	**53%**	**39%**
2001	**87%**	**80%**	**78%**	**73%**	**67%**
2002	**93%**	**86%**	**82%**	**78%**	**80%**
Student/Computer Ratio					
2000	**6.37**	**5.85**	**7.27**	**7.17**	**9.14**
2001	**5.89**	**6.14**	**6.16**	**6.48**	**7.29**
2002	**4.74**	**5.06**	**5.27**	**5.68**	**6.13**
Student/Multimedia Computer Ratio					
2000	**8.45**	**8.47**	**10.11**	**9.47**	**12.18**
2001	**7.10**	**7.47**	**8.12**	**8.82**	**9.96**
2002	**7.72**	**8.39**	**9.16**	**9.98**	**11.45**

CTAP 2002 School Technology Survey - Regional Comparison

		Region									
	CA	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
Connectivity												
Schools												
2000	**80%**	**85%**	**79%**	**84%**	**81%**	**88%**	**69%**	**79%**	**74%**	**86%**	**85%**	**89%**
2001	**90%**	**87%**	**88%**	**89%**	**91%**	**93%**	**83%**	**95%**	**90%**	**94%**	**92%**	**88%**
2002	**96%**	**95%**	**92%**	**94%**	**97%**	**95%**	**93%**	**97%**	**97%**	**100%**	**99%**	**95%**
Classrooms												
2000	**58%**	**65%**	**81%**	**65%**	**73%**	**77%**	**62%**	**70%**	**67%**	**67%**	**63%**	**34%**
2001	**77%**	**86%**	**100%**	**78%**	**81%**	**89%**	**74%**	**94%**	**93%**	**83%**	**82%**	**58%**
2002	**84%**	**82%**	**96%**	**81%**	**87%**	**87%**	**86%**	**94%**	**89%**	**87%**	**87%**	**76%**
Computer Access												
Students/Computer												
2000	**6.97**	**6.48**	**5.15**	**6.01**	**5.77**	**6.57**	**7.44**	**6.64**	**5.95**	**7.06**	**6.96**	**8.81**
2001	**6.37**	**5.84**	**3.84**	**5.25**	**6.03**	**5.78**	**6.66**	**5.49**	**5.57**	**6.47**	**6.53**	**7.54**
2002	**5.03**	**4.79**	**4.03**	**4.78**	**4.94**	**4.81**	**5.54**	**5.02**	**4.89**	**5.23**	**5.59**	**5.94**
Students/Multimedia Computer												
2000	**9.51**	**8.99**	**6.30**	**7.89**	**9.15**	**8.57**	**11.21**	**8.84**	**7.70**	**8.87**	**9.09**	**12.12**
2001	**8.24**	**7.63**	**4.66**	**7.13**	**7.64**	**7.44**	**11.65**	**6.96**	**6.77**	**7.89**	**8.62**	**9.72**
2002	**9.10**	**9.44**	**8.38**	**8.22**	**8.42**	**8.52**	**9.30**	**8.75**	**8.73**	**8.91**	**9.90**	**9.64**

1 Del Norte, Humboldt, Lake, Mendocino, Sonoma

2 Butte, Glen, Lassen, Modoc, Plumas, Shasta, Siskiyou, Tehama, Trinity

3 Alpine, Colusa, El Dorado, Nevada, Placer, Sacramento, Sierra, Sutter, Yolo, Yuba

4 Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Solano

5 Monterey, San Benito, Santa Clara, Santa Cruz

6 Amador, Calaveras, San Joaquin, Stanislaus, Tuolumne

7 Fresno, Kings, Madera, Mariposa, Merced, Tulare

8 Kern, San Luis Obispo, Santa Barbara, Ventura

9 Imperial, Orange, San Diego

10 Inyo, Mono, Riverside, San Bernardino

11 Los Angeles

(Counties represented in the 11 CTAP service regions)

I. EQUIPMENT

Over the last decade national attention has focused on the student-to-computer ratio as a measure of student access. As it is typically reported, it is computed by comparing the total number of students to the total number of computers within a specified geographic region or grouping of schools/districts. For example, a state or service region with 640,000 K-12 school children and 80,000 school computers would yield a student/computer ratio of 8.0 (80,000/640,000). This is important information, but it is not a complete portrait of student access to technology.

Another method of reporting computer access measures the student/computer ratio at each school within a state or region, and then reports the average of those ratios. This measure more accurately reflects student access to computers because it accounts for the fact that students typically have access to school computers at only one school.

Types of Computers

When researchers attempt to identify trends by gathering data over successive years, several methodological challenges emerge. One of those challenges is the use of definitions: Over time, definitions tend to change as programs and policies evolve. This is particularly true of educational technologies, as computer processing speed and hard drive capacity milestones are reached, and the market for "new and improved" technologies remains in its infancy. For these reasons, it is especially important to consider the evolving definition of the individual-use computer.

In the mid-1990's the differences between Multimedia computers (i.e., those with a CD-ROM drive) and non-Multimedia computers were notable. Multimedia computers were considered superior for most educational purposes because of their capacity to utilize Compact Discs (CD's) containing specific instructional programs, as well as their larger hard drives and faster microprocessors. Thus, in prior survey research efforts we made a distinction between different types of computers – and, in particular, Multimedia computers - based upon their complexity and degree of connectivity. For example, last year we reported student access to "Multimedia computers," "Internet-Capable Multimedia computers," and "Connected Internet-Capable Multimedia computers." These distinctions were important because each descriptive category identified computers based on their functional abilities and limitations and, thus, their capacity to impact instruction and student learning.

Over the last several years, however, a new (yet informal) standard for the "base model computer" has emerged, as virtually all new computers offered by manufacturers have been both Multimedia in function and Internet-capable. The emergence of this newly-defined "base model," then, makes it somewhat less important to highlight the between-computer distinctions of prior years. Thus, this year we simply report three measures of computer: "Computers" (meaning ALL computers), "Internet-Connected" computers, and "Multimedia" computers (based on the assumption that all recent-generation Multimedia computers are Internet-capable).[1]

[1] We recognize that a small percentage of older Multimedia computers may not be Internet-Capable, and we accept this potential discrepancy (though we consider it likely to be minor, if not insignificant) as a necessary limitation in the gathering and comparison of longitudinal data over several years.

Based on these distinctions, the following abbreviations are used throughout the report to represent the different types of computers found in schools:

- **Computers** • Includes all computers reported in the survey
- **IC** • Internet-Connected Computers
- **MM** • Multimedia Computers

Table 1.1 reports student access to computers based on statewide and/or regional data. Again, for purposes of clarity, we note that these values are computed by comparing the total number of students to the total number of computers within a state or region.

TABLE 1.1 Equipment - Statewide/Regional Measures

	CA
Ratios	
Students/Computer	5.30
Students/IC Computer	7.01
Students/MM Computer	9.09
Computers/Classroom	4.22
IC Computers/Classroom	3.19
MM Computers/Classroom	2.46
Percentages	
IC Computers	76%
MM Computers	58%

Table 1.2 reports student access to computers, and the availability of computers in classrooms, based on the average of school-level student/computer ratios. Again, we note that this measure more accurately reflects access because students typically have access to school computers at only one school, and not at any school within a state or geographic region.

TABLE 1.2 Equipment - School Averages

	CA
Student Access Measures	
Students/Computer	6.65
Students/IC Computer	18.59
Students/MM Computer	23.16
Classroom Access Measures	
Computers/Classroom	4.02
IC Computers/Classroom	2.93
MM Computers/Classroom	2.13

In addition to interest in the Multimedia and connectivity capacities of the "basic" classroom computer, there are other computer traits which merit our attention. Indeed, we have shifted our focus toward computer "age," since this is an important dimension of long-term technology planning as computers reach the end of their average "life cycle" and need to be replaced. As computers become more commonplace in schools, they will need to be replaced not necessarily because they have become obsolete (as in previous years), but rather because they've simply "worn out." Table 1.3 presents estimates of the age of the current inventory of computers in schools. The values presented below are averages of estimates gathered at each school.

TABLE 1.3 Equipment - Estimates of Age of Current Computer Inventory[2]

	CA
Less than 1 year old	24%
Between 1 and 2 years old	17%
Between 2 and 3 years old	17%
Between 3 and 4 years old	14%
More than 4 years old	28%

II. CONNECTIVITY

Connectivity is a critical component of school technology. Connectivity refers to the degree of telecommunications infrastructure present in schools, and the ability of schools to use that infrastructure to share information, access various instructional resources electronically, and access the Internet. The survey collected data on the number of schools and classrooms with "dedicated, non-dial up" Internet connections. Table 2.1 reports Internet connectivity based on the random sample's total number of connected schools and classrooms within the state or CTAP region.

TABLE 2.1 Internet Connectivity - Statewide/Regional Measures

	CA
Schools connected to the Internet	96%
Classrooms connected to the Internet	84%

[2] May not add up to 100% since these are averages of values reported by individual schools.

Table 2.2 reports classroom Internet connectivity based on the average degree of connectivity measured at each school in the random sample.

TABLE 2.2 Internet Connectivity - School Measures

	CA
Classrooms (avg)	83%
Schools with No Classrooms Connected	6%
Schools with All Classrooms Connected	61%

In concert with bandwidth, connectivity speed is an important consideration for the effective use of educational technologies. Table 2.3 reports the percentage of schools offering varying degrees of connectivity speed.

TABLE 2.3 Internet Connectivity Speed

Connection Speed	CA
Less than 1.54 megabits	27.7%
1.54 megabits or greater, but less than 3.0 megabits	55.7%
3.0 megabits or greater, but less than 10 megabits	6.3%
10 megabits or greater, but less than 45 megabits	6.2%
45 megabits or greater, but less than 100 megabits	0.1%
100 megabits or greater, but less than 155 megabits	3.1%
155 megabits or greater, but less than 1 gigabit	0.9%
1 gigabit or greater	0.1%

III. TECHNICAL SUPPORT

From the time computers first emerged in school classrooms, it has been necessary to support and maintain them. As the number of computers in schools has grown, the issue of technical support has become increasingly important.

Additional demands to create computer networks and help teachers integrate educational technologies with instruction has led many schools and districts to create personnel categories dedicated to technology use and management. In order to look at the total cost of ownership for computers and information systems in schools, it is important to look at all the internal and external support positions and contracts that schools have determined are necessary to establish and maintain a computer technology network.

In addition to presenting data on the absolute number of technical support personnel, we also present personnel numbers per 100 students, teachers, and computers. The purpose of selecting "100" as a measurement unit is not to set a desirable policy "target." To be sure, it is difficult to estimate exactly how many students, teachers, or computers can be adequately serviced through support personnel. However, by standardizing personnel measurement through the use of a common denominator (i.e., "per 100" of some unit), we can track progress from year-to-year, and make cross-school comparisons, despite

enrollment differences between schools, or enrollment changes in the same school from year to year. Table 3.1 reports the numbers of certificated and classified personnel responsible for providing technical support

TABLE 3.1 Technical Support - Average FTE Technology Support Personnel per School

	CA
Certificated Support Personnel (CE)	
CE/100 Students	0.05
CE/100 Teachers	0.87
CE/100 Computers	0.29
Percent of schools with NO CE	62%
Classified Support Personnel (CL)	
CL/100 Students	0.08
CL/100 Teachers	1.40
CL/100 Computers	0.44
Percent of schools with NO CL	45%

Survey respondents were also asked to estimate the time for support staff to respond to their needs. Although there is no universal minimum or maximum acceptable response time, it makes sense that response times should be minimized, since non-functioning equipment cannot impact student learning. Response time values may reflect the adequacy of the number of staff available, or the competencies of support providers (for example, low-skilled technicians may spend more time resolving each support issue). Table 3.2 reports estimated response times for hardware repair and technical support (e.g., help with system freeze/crash, etc.).

TABLE 3.2 - Estimated Repair and Support Response Time

	Hardware Repair	Support Response
2 hours or less	2%	13%
More than 2 hours, but by end of the day	8%	31%
Within 2-5 working days	47%	39%
More than a week, but less than a month	33%	14%
A month or more	9%	3%

IV. CURRICULUM SUPPORT

Support and training for the integration of computer technologies into daily lesson planning has emerged as a critical area in recent years. Most experts agree that, while acquiring hardware and connectivity is a necessary first step, computers will have little impact on students unless teachers become skilled in using them to challenge students, deliver content, and reinforce important concepts.

Tables 4.1 and 4.2 report numbers of certificated and classified personnel at each school responsible for providing support and training for curricular integration of educational technologies.

TABLE 4.1 Curriculum Support - Average Number of Certificated FTE Personnel per School

	CA
Staff Development Coordinator	0.12
Technology Resource Teacher	0.17
Other	0.06
Total	0.34
Percent of schools with NO Certificated curriculum support personnel	50%

TABLE 4.1 Curriculum Support - Average Number of Classified FTE Personnel per School

	CA
Staff Development Coordinator	0.04
Technology Resource Teacher	0.10
Other	0.04
Total	0.18
Percent of schools with NO Classified curriculum support personnel	74%

Table 4.3 reports response times to teacher requests for assistance with integrating technology into the curriculum (such as understanding how to use Web resources in, for example, a unit on Egyptian history).

Table 4.3 Curricular Support Response Times

	Curricular Support Response
2 hours or less	10%
More than 2 hours, but by end of the day	22%
Within 2-5 working days	44%
More than a week, but less than a month	17%
A month or more	8%

V. TECHNOLOGY PLANNING & USE

Technology planning is the necessary first step toward the effective use of computers in classrooms. Table 5.1 provides data on school technology planning.

TABLE 5.1 Technology Planning

	Yes
Was your school involved in the creation/updating of your district technology plan?	69%
Does your school have a site plan that includes technology planning?	76%

Anecdotal accounts and small-scale case studies provide a great deal of insight about the uses of computer technologies in classrooms. There have been, however, few large-scale studies documenting the detailed and specific practices of teachers and their use of computers. Such research is time and labor-intensive.

Here, we attempt to provide some insight regarding the beliefs and practices of teachers, with the caveat that our data has limitations. For example, the school-level values we report are likely to reflect the input of only one or several individuals at a school, rather than the sum of responses from all teachers in each school. Still, this information can be of value to policymakers in identifying areas that merit further research. Table 5.2 reports the average school-level frequency of technology use by content area.[3]

TABLE 5.2 Reported Frequency of Technology Use by Content Area

	Daily	2-5 Days/Wk	Between Once/Wk and monthly	Less than monthly	Never
Reading/Language Arts	36%	34%	25%	4%	1%
Mathematics	27%	35%	29%	8%	2%
Science	11%	27%	39%	18%	4%
History/Social Science	11%	27%	42%	16%	3%

[3] Numbers may not add up to 100 percent due to rounding.

VI. EMERGING TECHNOLOGIES

This section reports data on trends and the uses of new or emerging technologies at schools. Note that home-school communications, and the use of e-mail, appear to be dominant trends.

Table 6.1 Prevalence of Emerging Technologies at Schools

Emerging Technology	
Using distance learning for students	9%
Using distance learning for teacher or administrator professional development	20%
Using an assessment model that explores the impact of technology on student achievement	13%
Partnering with business or the community on technology projects	23%
Using technology to improve communications between the school and the home	49%
Providing access to email and/or Internet for students at home	11%
Providing computers or other technology equipment for student use at home	11%
Providing access to email and/or Internet for staff at home	48%
Providing computers or other technology equipment for staff use at home	33%

VII. ACCESS BY ELIGIBILITY FOR FREE AND REDUCED PRICE MEALS

This section reports data on the student-to-multimedia-computer ratio and connectivity by the percent of students eligible for free or reduced price meals from the National School Lunch Program. This analysis is provided as a measure of the "Digital Divide" in California schools. Nationally, attention has been focused on the Digital Divide and the question as to whether or not all groups of students have equal access to hardware and Internet connectivity in schools. Table 7.1 presents data on the students to multimedia computer by free and reduced price meal eligibility. Table 7.2 displays Internet connectivity data by free and reduced price meal eligibility.

TABLE 7.1 Students to Multimedia Computer by Eligibility for Free and Reduced Price Meals

Schools with	CA
0-20% of Students Eligible	7.72
21% to 40% of Students Eligible	8.39
41% to 60% of Students Eligible	9.16
61% to 80% of Students Eligible	9.98
81% or More of Students Eligible	11.45

TABLE 7.2 Percent of Classrooms Connected to the Internet by Eligibility for Free and Reduced Price Meals

Schools with	CA
0-20% of Students Eligible	93%
21% to 40% of Students Eligible	86%
41% to 60% of Students Eligible	82%
61% to 80% of Students Eligible	78%
81% or More of Students Eligible	80%